Center for Integrated Nanotechnologies

Sandia National Laboratories • Los Alamos National Laboratory

Facilities Development

- Core Facility
- Gateway to Los
- Gateway to Sandia
- Initial Instrumentation

User Program

- Operating Principles
- CINT Structure
- Jump-Start Program

Towards Full Operations

"One scientific community focused on nanoscience integration"

One community focused on nanoscience integration

CINT Facility Design

- Science Thrusts
- DOE Science
- 2001 User Workshop
- BESAC Reviews
- NSRC Workshop
- Program Validation

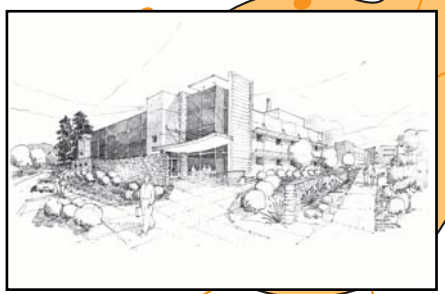
Collaborators
Users
University
Industry

CINT Core Facility

National User Facilities

- LANSCE
- NHMFL
- CRF

CINT Gateway to Los Alamos



CINT Gateway to Sandia

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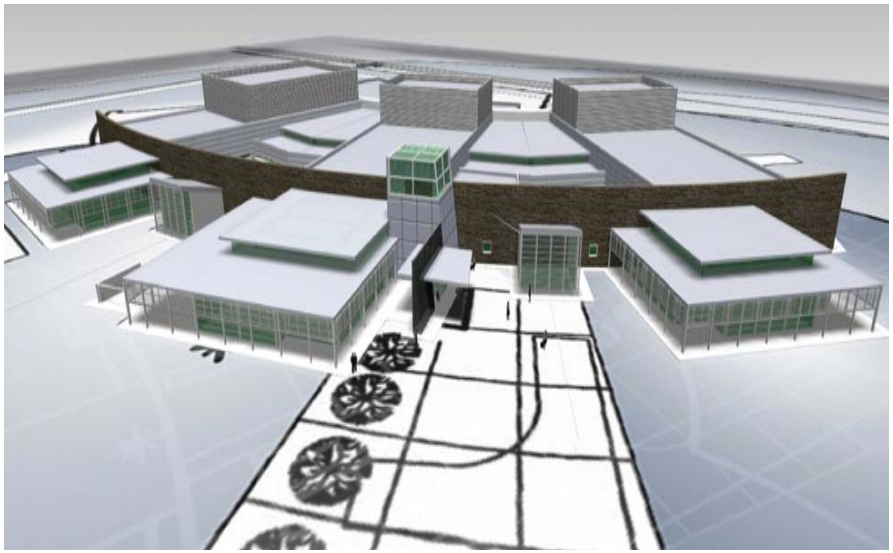
Core Facility will provide common ground for collaboration and integration



- **Located in Albuquerque on Eubank Boulevard**
- **Outside KAFB fence**
- **96,000 GSF building size**
- **Three experimental modules**
- **Initial construction activities in FY03**
- **Construction complete in FY06**

- **Low vibration for characterization**
- **Chemical/biological synthesis**
- **Clean space for Integration**
- **Interaction areas**
- **Visitor office space**
- **High-speed communications**

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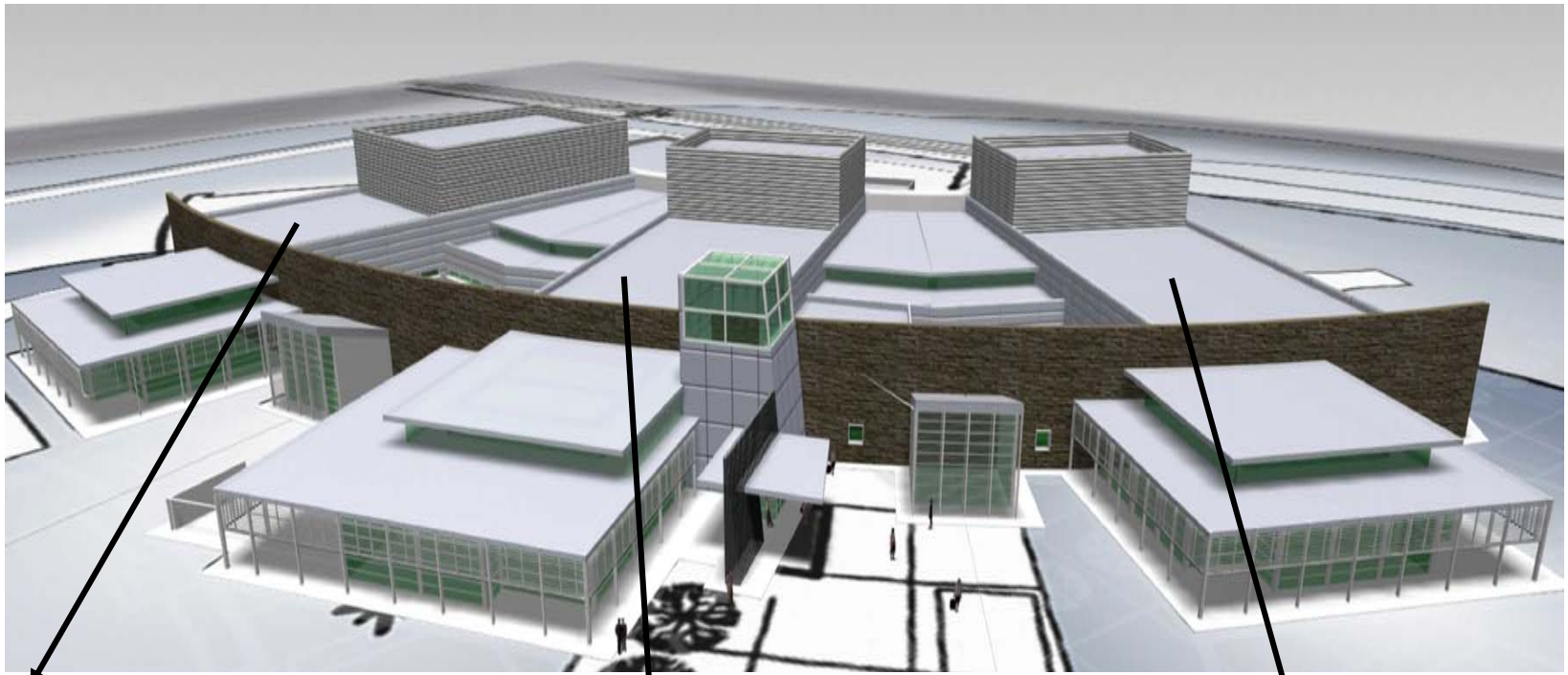
Core Facility will provide common ground for collaboration and integration



Integration Lab
- Clean Bay
- E-beam Writer
- Optical Lithography
- High resolution

Synthesis Labs
- MBE
- Thin Film Synthesis
- Self Assembly
- Bio & Organic
- Fluidics

Quiet Labs
- TEM, SEM
- Optical
- Scanning Probes
- Chemical Analysis
- Surface Analysis

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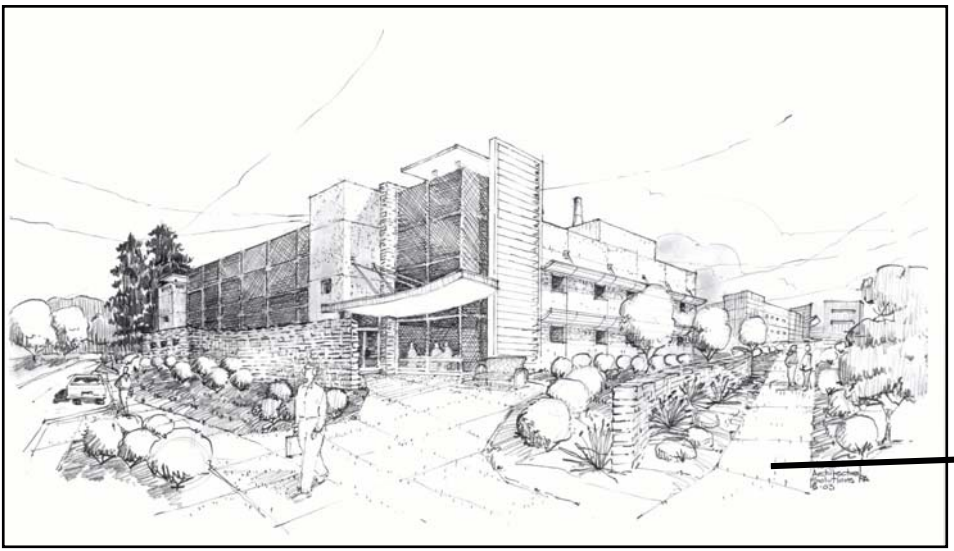
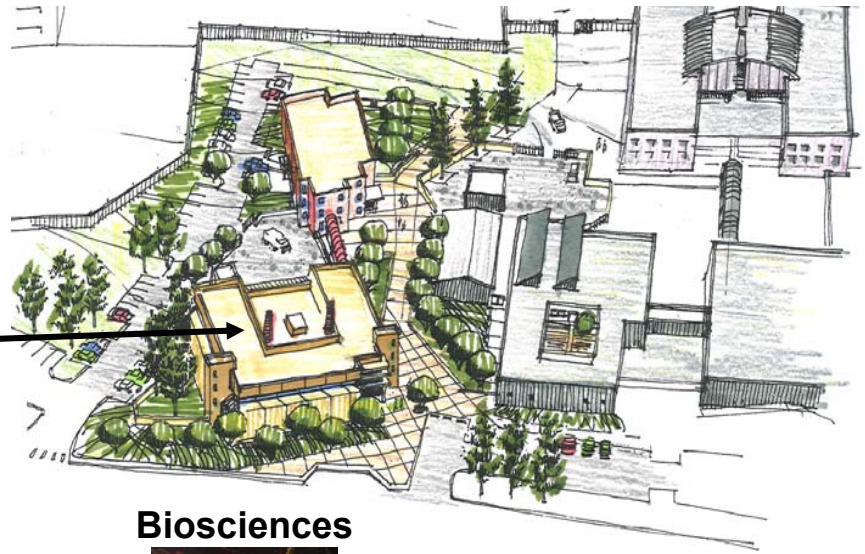
Gateway to Los Alamos will focus on Nanomaterials and Biosciences



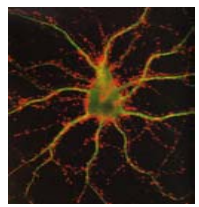


34,000 sq-ft, new construction

Laboratory Capabilities

- Biochemistry/Molecular Biology
- Cell Growth
- Materials Synthesis
- Novel Optical and Scanning
- Optical Spectroscopy
- Materials Characterization
- Theory, Computing, Visitor Space

Biosciences



National High Magnetic Field Lab

Los Alamos Neutron Science Center

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Gateway to Sandia will focus on Nanomaterials and Microfabrication

Existing Space

Microelectronics Development Lab

Compound Semiconductor Research Lab

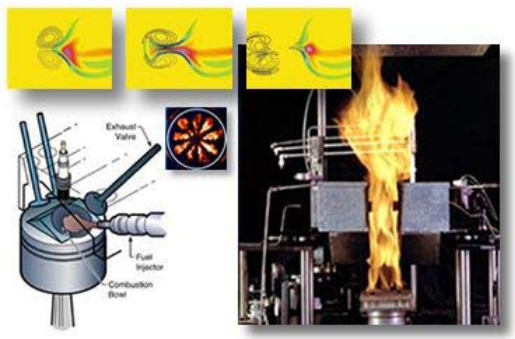
Microfabrication
- CMOS, MEMS, NEMS
- MOCVD

Nanomaterials
- AT-STM, IFM, NSOM
- LEEM, TEM
- Nanocluster synthesis

Theory & Computing

Visitor Space

Combustion Research Facility



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CINT Facility Initial Instrumentation

Initial Capitalization

Instrumentation funded through the Construction Project

- Instrumentation ranging from $0.1M to $2.5M
- Instrumentation budget ~$17.3M

Existing Instrumentation

- Some existing DOE funded instrumentation will be located in the CINT facilities

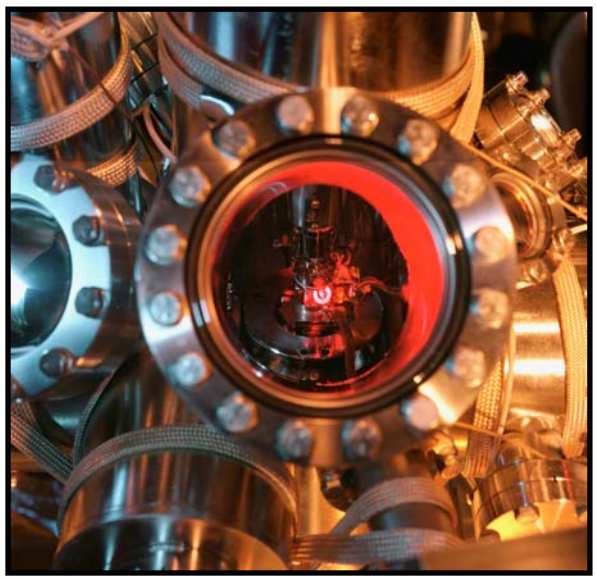
In steady state CINT facilities will be maintained at state-of-the-art through continuous investment in instrumentation

CINT Facility Initial Instrumentation

Initial Capitalization

Long Lead Purchase Items - specifications 1st quarter 2004

- E-beam writer
- Analytical TEM/STEM
- MBE system
- User input part of final specifications



Instrumentation Tool Sets

- Clean Room Tools
- SEMs, Scanning Probes
- Nanoindenters
- Ultrafast/transient spectrometers
- X-ray diffractometers
- Optical Microscopy/Spectroscopy
- Low Temperature Transport
- User input part of final

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Uniform NSRC User Access Policy

Preamble

- State-of-the-art Equipment and
- Skilled Staff
- User Scientific Program

Peer Review and Advisory Bodies

- Scientific Advisory Committee
- Users Executive Committee
- Proposal Review Committees

Evaluation Criteria

- Scientific merit
- Technical feasibility
- Capability of proposal team
- Availability of resources required

Modes of User Access

- General User Access
  single experiment to program proposal
- Partner User
  carry out research and enhance capabilities

User Access Allocation

- Based on PRC rankings

Proprietary and Non- Proprietary Research

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CINT Management Structure

Partnership

- 50/50 partnership between Los Alamos and Sandia defined by a Memorandum of Understanding

Leadership

- Director – Terry Michalske SNL
- Associate Director – Don Parkin LANL
- Chief Scientist – Andy Shreve LANL (interim)
- Outreach Coordinator – Neal Shinn SNL (interim)

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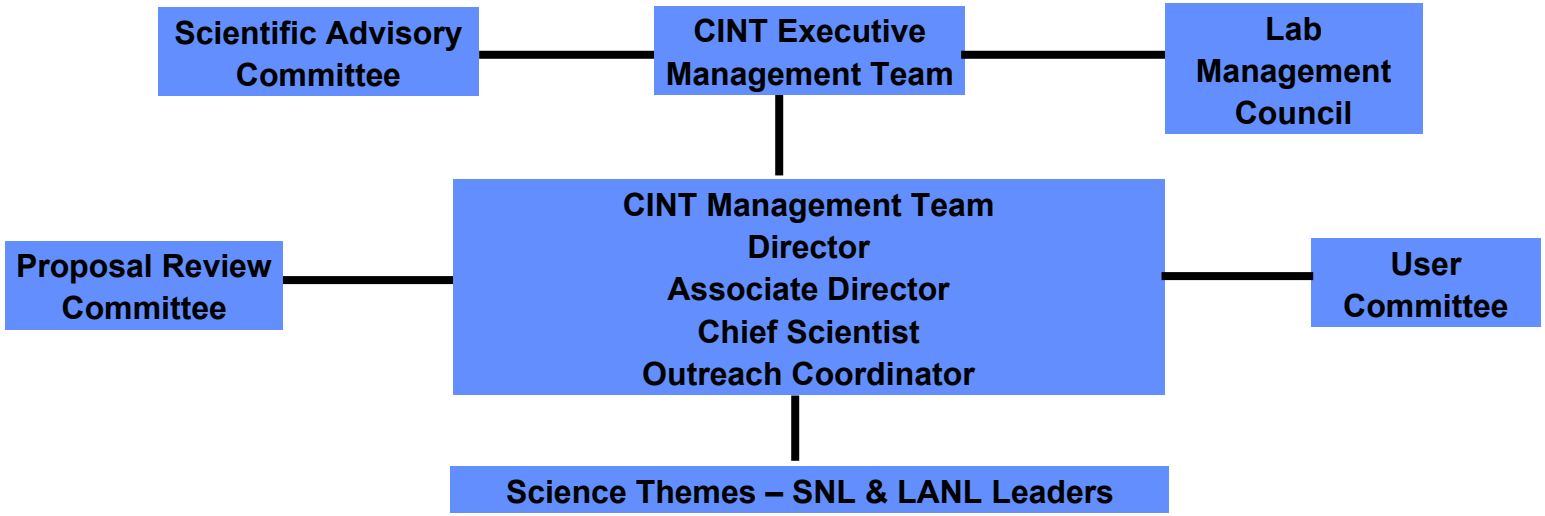
Organizational Structure



Management Team

Terry Michalske
Don Parkin
Andy Shreve
Neal Shinn

Scientific Advisory Committee

Tom Picraux, Chairman
Sankar Das Sarma
Harold Craighead
Laura Greene
Frans Spaepen
Steve Brueck
Dawn Bonnell
Paul Barbara
Julia Weertman
Robert Haddon
Bob Westervelt
Daniel Cox
Matt Tirrell

Governance Board

Al Romig
Tom Meyer Richard
Smalley Mike Roco
Herb Goronkin

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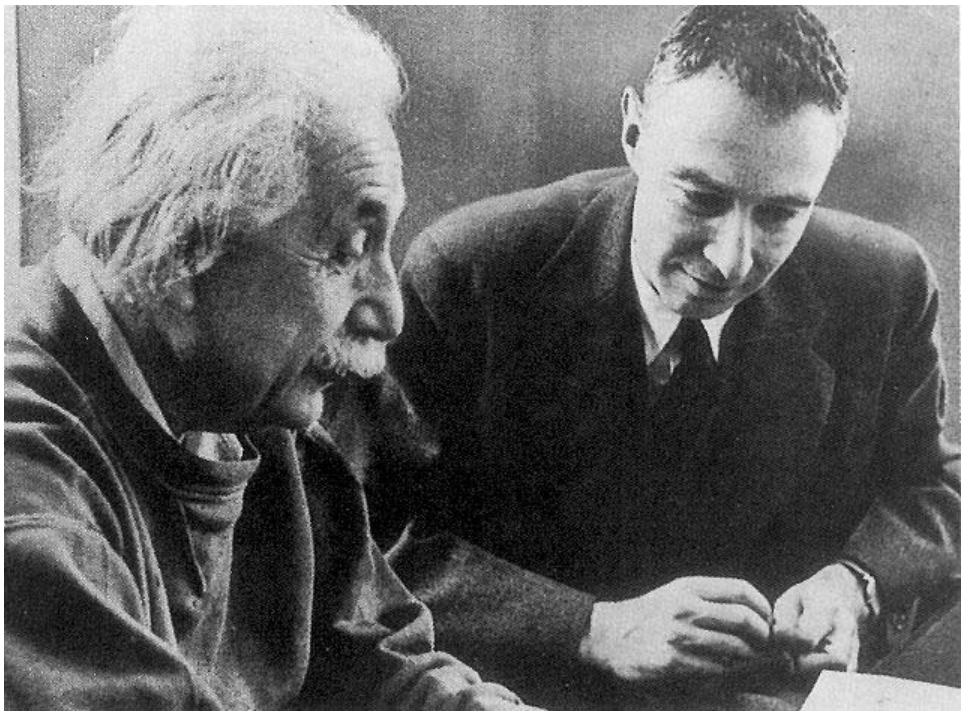
CINT Chief Scientist



Contact search committee co-chairs
Alan Hurd ajhurd@lanl.gov
George Samara gasamar@sandia.gov

The Center for Integrated Nanotechnologies is seeking exceptional candidates for the position of Chief Scientist.

The Chief Scientist will work with the staff of both laboratories and with the external scientific community to bring CINT to a position of world-class leadership in nanoscale science and technology.

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CINT Jump-Start Program

In response to input from CINT and other NSRC workshops, BESAC reviews, and the nanoscience community, the DOE Office of Science initiated a "jump-start" program at each NSRC in 2003

NSRC Jump-Start Program

- Small starter user program ~10% of planned full operations
- Leverage existing science programs and equipment

CINT Jump-Start Program

- Joint and related SNL/LANL science programs
  - Top-Down/Bottom-Up Assembly
  - Energy Transfer
  - Mechanical Forces
  - Biological Materials
- Capabilities
  - Synthesis and Characterization
  - Theory and Simulation
  - Leveraged Facilities
  - National User Facilities
- Slowly grow user programs with user input and experience

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Toward Full CINT Operations

Under Construction

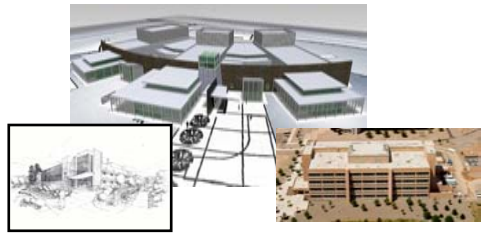
Ramp up

User/CINT experience

User input – science, facilities

Growth

Science directions



Jump-Start User Program
Leveraged Science
Leveraged Capabilities
Leveraged Facilities
National User Facilities

Full User Program
Leveraged Science
Leveraged Capabilities
Leveraged Facilities
National User Facilities

2003 → 2006

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Integration Challenges and Workshop Discussion Topics

Overview of Challenges and Opportunities in Nanoscience Integration

<u>Discussion Sessions</u>

- **Mechanical Responses Across Multiple Length Scales**
- **Characterization, Theory and Modeling Needs Across Multiple Length Scales**
- **New Approaches to Nanoscale Synthesis and Integration**